

[Print](#)[Close](#)

Marshall Star, November 23, 2011 Edition

MARSHALL STAR

In This Week's Star  ([Click to Expand](#))

- › [Administrator Bolden Visits Marshall to View Space Launch System Hardware and Software Progress](#)
- › [Marshall Director Lightfoot, Other NASA Leaders Address Senate Subcommittee](#)
- › [NASA Flies Robotic Lander Prototype to New Heights](#)
- › [Space Station Trio Lands Safely in Kazakhstan](#)
- › [Marshall Team to Ring in Holiday Cheer at Events Dec. 1, Dec. 6](#)
- › [Chandra Contributes to Black Hole Birth Announcement](#)
- › [Fifth Annual Science & Technology Jamboree to be held Nov. 30](#)
- › [Obituaries](#)

Administrator Bolden Visits Marshall to View Space Launch System Hardware and Software Progress

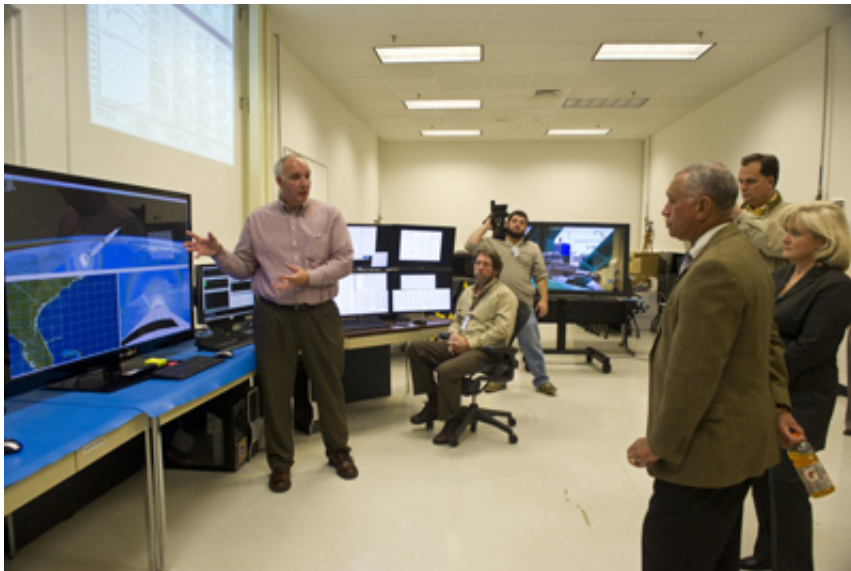
On Nov. 18, NASA Administrator Charles Bolden toured the Thrust Vector Control Test Lab and the Hardware-in-the-Loop Simulation Lab at the Marshall Space Flight Center where engineers are developing and testing the Space Launch System's guidance, navigation and control software and avionics hardware. The Thrust Vector Control Test Lab supports the development, certification and qualification testing of control mechanisms, primarily Thrust Vector Control, or TVC, actuators and systems -- electro-mechanical or electro-hydraulic mechanisms that vector the vehicle's propulsion system, guiding the vehicle during flight. The integrated Hardware-in-the-Loop lab, using digital computer models and prototype software/hardware, demonstrates real-time flight control of the launch vehicle during ascent. The labs can be integrated together to test flight hardware and software on the ground.

Huntsville-area news media covered the event and participated in the tour.

Image right: NASA Administrator Charles Bolden, second from right in foreground, visited the Marshall Space Flight Center Nov. 18. While touring Space Launch System support facilities, he discusses the Thrust Vector Control Test Lab with Marshall team members, in foreground from left, Kendall Junen, control systems manager; Lisa Bates, TVC systems integration and components branch chief; and Jody Singer, SLS deputy. (NASA/MSFC/Emmett Given)



Marshall is leading design and development of the Space Launch System on behalf of the agency. The new heavy-lift launch vehicle will expand human presence beyond low-Earth orbit and enable new missions of exploration across the solar system. Its first full-scale test flight is set for 2017.



In addition to the lab tour, Bolden viewed a Robotic Lunar Lander test flight, met with Marshall Center direct reports and was briefed on the Solar Wing Electrons, Alphas and Protons, or SWEAP, instrument.

Image left: Drew Hall, left, system integration lab lead for the Hardware-in-the-Loop Simulation Lab in Building 4205, explains how the Space Launch System's flight software, avionics and hardware are integrated to NASA Administrator Charles Bolden, at right in the foreground, while local media and SLS Deputy Jody Singer look on. (NASA/MSFC/Emmett Given)

[› Back to Top](#)

Marshall Director Lightfoot, Other NASA Leaders Address Senate Subcommittee

NASA Administrator Charles Bolden and three center directors, including Marshall Space Flight Center Director Robert Lightfoot, testified before a U.S. Senate subcommittee Nov. 17 to outline the agency's continuing mission of exploration and discovery -- and to present a unified message about the nation's future in space: NASA is committed to success.

Bolden and Lightfoot -- along with Michael Coats, director of the [Johnson Space Center](#), and Robert Cabana, director of the [Kennedy Space Center](#) -- spoke before the [Subcommittee on Science and Space](#) about NASA's near- and long-term plans for human space exploration and the value of those



The four discussed NASA's safe, cost-effective approach to delivering the powerful new [Space Launch System](#), [Multi-Purpose Crew Vehicle](#) and 21st century Ground Support that will, in coming years, enable human explorers and science payloads to travel on unprecedented journeys into the solar system.

"We're exploring innovative ways to drive a rapid pace of progress, reduce lifecycle costs and minimize the risks in incorporating new technologies in the system designs," Bolden said.



Robert Lightfoot. (NASA/MSFC)

He and the center directors provided insight about how NASA's commitment to crewed solar system exploration will support and benefit from science on the International Space Station; deliver rewarding new technologies and applications on Earth; serve and integrate with increased commercial space activities; and drive new collaboration with NASA's partners around the world.

Lightfoot, Coats and Cabana took questions from several subcommittee members, including U.S. Sen. Kay Bailey Hutchison of Texas; Sen. Bill Nelson and Sen. Marco Rubio of Florida; and Sen. John Boozman of Arkansas. The three directors spoke about the necessary changes their teams have faced this year to meet budgets and ensure success -- and each praised the NASA workforce for its resilience and dedication even in uncertain times.

Lightfoot said Marshall is "responding to NASA's new funding and programmatic environment by reorganizing and downsizing to become more affordable, adaptable and relevant to the nation's needs -- while retaining the capabilities we think we bring to the nation." He also emphasized to the subcommittee the value and importance of working across centers toward the common goal of implementing NASA's human spaceflight efforts.

"We're excited about the path forward for the agency and we look forward to the new opportunities and challenges that will bring," he added.

The subcommittee hearing, titled "NASA's Human Space Exploration: Direction, Strategy, and Progress," was held at the Russell Senate Office Building in Washington. Archived video of the entire hearing is available [here](#). Lightfoot's comments begin at the 93:48 mark in the video.

Smith, an AI Signal Research Inc. employee, supports the Office of Strategic Analysis & Communications.

[› Back to Top](#)

NASA Flies Robotic Lander Prototype to New Heights

By Kim Newton



NASA successfully completed the final flight in a series of tests of a new robotic lander prototype at the Redstone Test Center's propulsion test facility on the U.S. Army Redstone Arsenal in Huntsville. Data from this test series will aid in the design and development of a new generation of small, smart, versatile robotic landers capable of performing science and exploration research on the surface of the moon or other airless bodies in the solar system, such as asteroids or the planet Mercury.

Image left: Robotic lander prototype, dubbed Mighty Eagle, ascends to 100 feet at the Redstone Test Center's propulsion test facility, hovers and then demonstrates the equivalent of an autonomous landing on the lunar surface. (NASA/MSFC)

Since early October, the Robotic Lander Development Project at the Marshall Space Flight Center has subjected the lander prototype to a series of more complex outdoor flight tests maneuvers. The team steadily increased the lander's flight profile, starting by hovering the lander -- dubbed Mighty Eagle -- at 3 feet, then 30 feet and finally a record 100-foot flight test.

During the 100-foot flight test, the lander autonomously flew for 30 seconds. The Mighty Eagle ascended to 100 feet, hovered and then demonstrated the equivalent of an autonomous landing on the lunar surface. The final maneuver simulated the required descent approach by horizontally translating 30 feet while descending and landing on target. The test demonstrated the lander's ability to maneuver to avoid hazards before performing a safe, controlled landing.

"The successful completion of the Mighty Eagle lander prototype provides a high level of confidence in our flight system design which significantly reduces cost and schedule," said Julie Bassler, Robotic Lander Development project manager at the Marshall Center. "Our combined NASA and contractor team went from the drawing board to successfully flight testing an autonomous, closed-loop, lander prototype system in less than two years," she said. "Mighty Eagle has performed well, demonstrating precision ascents, descents and horizontal translation flights to prove the lander can control itself and land safely."

"Our small team has worked tirelessly to develop a robust lander system," said Dr. Greg Chavers, lead systems engineer for the Robotic Lander Development Project at Marshall. "The prototype lander has the capability to launch, descend and land safely on its own -- without a man in the loop -- demonstrating the lander's autonomous and reusable test capability. Our team has matured the lander's guidance, navigation and control algorithms, which provided stable control of the lander, even through light wind and rain."

Mighty Eagle is a three-legged prototype that resembles an actual flight lander design. It is 4 feet tall and 8 feet in diameter and weighs 700 pounds when fueled with 90 percent hydrogen peroxide.

The lander receives its commands from an onboard computer that activates its 16 onboard thrusters -- 15 pulsed and one gravity-cancelling thruster -- to carry it to a controlled landing using a pre-programmed flight profile. The prototype serves as a platform to develop and test algorithms, sensors, avionics, software, landing legs and integrated system elements to support autonomous landings on airless planetary bodies, where aero-braking and parachutes are not options.

The next test phase of the test series is set to resume in early spring when weather is more favorable for outdoor flight test. This new test series will test enhanced navigation capabilities.

Development and integration of the lander prototype is a cooperative endeavor led by the Robotic Lunar Lander Development Project at the Marshall Center; Johns Hopkins Applied Physics Laboratory in Maryland; and the Von Braun Center for Science and Innovation, which includes the Science Applications International Corporation, Dynetics Corp., Teledyne Brown Engineering Inc. and Millennium Engineering and Integration Company, all of Huntsville.

The project is partnered with the U.S. Army's Test and Evaluation Command's test center located at Redstone Arsenal. The Redstone Test Center is one of six centers under the U.S. Army Test and Evaluation Command and has been a leading test facility for defense systems since the 1950s. Utilizing an historic test site at the arsenal, the project is leveraging the Redstone Test Center's advanced capability for propulsion testing.

For more photos of the hardware visit <http://www.nasa.gov/roboticlander>.

Newton is a public affairs officer in the Office of Strategic Analysis & Communications.

[› Back to Top](#)

Space Station Trio Lands Safely in Kazakhstan

NASA news release

Three International Space Station crew members safely returned to Earth on Nov. 21, wrapping up nearly six months in space during which NASA and its international partners celebrated the 11th anniversary of continuous residence and work aboard the station.

Image right: Russian support personnel work to get crew members out of the Soyuz TMA-02M spacecraft shortly after the capsule landed with Expedition 29 Commander Mike Fossum and Flight Engineers Sergei Volkov and Satoshi Furukawa in a remote area outside of the town of Arkalyk, Kazakhstan, on Nov. 21. (NASA/Bill Ingalls)



Expedition 29 Commander Mike Fossum, Flight Engineers Satoshi Furukawa of the Japan Aerospace Exploration Agency and Sergei Volkov of the Russian Federal Space Agency landed their Soyuz spacecraft in frigid conditions on the central steppe of Kazakhstan at 8:25 p.m. CST. The trio arrived at the station June 9. They spent 167 days in space and 165 days on the complex. Volkov, a two-time station crew member, now has accumulated 366 days in space.

Before leaving the station, Fossum handed over command to NASA's Dan Burbank, who leads Expedition 30. Burbank and Flight Engineers Anatoly Ivanishin and Anton Shkaplerov of Russia will continue research and maintenance aboard the station.

The remaining Expedition 30 crew members, NASA astronaut Don Pettit, European Space Agency astronaut Andre Kuipers and cosmonaut Oleg Kononenko, are scheduled to launch Dec. 21 from the Baikonur Cosmodrome and dock with the station Dec. 23.

To follow Twitter updates from Burbank, visit <http://twitter.com/AstroCoastie>.

To view social media updates from Fossum's mission, visit http://twitter.com/astro_aggie and <http://go.nasa.gov/oZgHtl>.

Marshall Team to Ring in Holiday Cheer at Events Dec. 1, Dec. 6

The Marshall Space Flight Center team will see what fun it is to enjoy the holiday season at two celebrations in December.

The center will host a rocket-lighting ceremony from 4:45-5:15 p.m. Dec. 1 at Marshall's Rocket Park, near the intersection of Rideout and Mercury roads. Thousands of colored lights will twinkle all the way down the Saturn I -- the tallest of the park's historic rockets. The lights will be officially lit by Marshall Center Deputy Director Gene Goldman and a special guest from the North Pole. Guests will enjoy hot cocoa and cookies, and music by children from the Marshall Child Development Center. In case of rain, the event will be held on the 10th floor of Building 4200.

The Marshall Center will hold its annual holiday reception from 1-3 p.m. Dec. 6 at Activities Building 4316. Hors d'oeuvres and desserts will be provided by Kathleen's Catering & Chocolate Gallery of Huntsville. Marshall Center team members Shane Adkins, Lawrence Jones and Raul Mejia from the Marshall Exchange Music Club will offer live music throughout the reception. Guests also can get their picture made with Santa.

Both events are sponsored by the Marshall Exchange. Watch ExplorNet for more information.

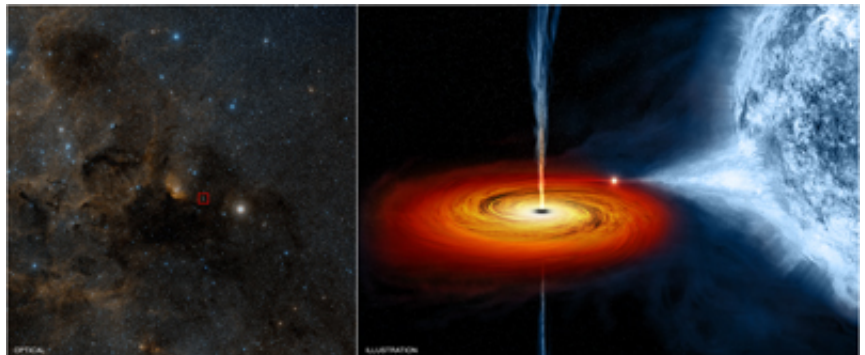
[› Back to Top](#)

Chandra Contributes to Black Hole Birth Announcement

NASA news release

New details about the birth of a famous black hole that took place millions of years ago have been uncovered, thanks to a team of scientists who used data from NASA's Chandra X-ray Observatory as well as from radio, optical and other X-ray telescopes.

Image right: On the left, an optical image from the Digitized Sky Survey shows Cygnus X-1, outlined in a red box. Cygnus X-1 is located near large active regions of star formation in the Milky Way, as seen in this image that spans some 700 light years across. An artist's illustration on the right depicts what astronomers think is happening within the Cygnus X-1 system. Cygnus X-1 is a so-called stellar-mass black hole, a class of black holes that comes from the collapse of a massive star. The black hole pulls material from a massive, blue companion star toward it. This material forms a disk (shown in red and orange) that rotates around the black hole before falling into it or being redirected away from the black hole in the form of powerful jets. (Photo credit: X-ray: NASA/CXC; Optical: Digitized Sky Survey)



Over three decades ago, Stephen Hawking placed -- and eventually lost -- a bet against the existence of a black hole in Cygnus X-1. Today, astronomers are confident the Cygnus X-1 system contains a black hole, and with these latest studies they have remarkably precise values of its mass, spin, and distance from Earth. With these key pieces of information, the history of the black hole has been reconstructed.

"This new information gives us strong clues about how the black hole was born, what it weighed and how fast it was spinning," said author Mark Reid of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. "This is exciting because not much is known about the birth of black holes."

Reid led one of three papers -- all appearing in the Nov. 10 issue of The Astrophysical Journal -- describing these new results on Cygnus X-1. The other papers were led by Jerome Orosz from San Diego State University and Lijun Gou, also from the Harvard-Smithsonian Center for Astrophysics.

Cygnus X-1 is a so-called stellar-mass black hole, a class of black holes that comes from the collapse of a massive star. The black hole is in close orbit with a massive, blue companion star.

Using X-ray data from Chandra, the Rossi X-ray Timing Explorer and the Advanced Satellite for Cosmology and Astrophysics, a team of scientists was able to determine the spin of Cygnus X-1 with unprecedented accuracy, showing that the black hole is spinning at very close to its maximum rate. Its event horizon -- the point of no return for material falling towards a black hole -- is spinning around more than 800 times a second.

An independent study that compared the evolutionary history of the companion star with theoretical models indicates that the black hole was born some 6 million years ago. In this relatively short time -- in astronomical terms -- the black hole could not have pulled in enough gas to ramp up its spin very much. The implication is that Cygnus X-1 was likely born spinning very quickly.

Using optical observations of the companion star and its motion around its unseen companion, the team made the most precise determination ever for the mass of Cygnus X-1, of 14.8 times the mass of the sun. It was likely to have been almost this massive at birth, because of lack of time for it to grow appreciably.

"We now know that Cygnus X-1 is one of the most massive stellar black holes in the galaxy," said Orosz. "And, it's spinning as fast as any black hole we've ever seen."

Knowledge of the mass, spin and charge gives a complete description of a black hole, according to the so-called "No Hair" theorem. This theory postulates that all other information aside from these parameters is lost for eternity behind the event horizon. The charge for an astronomical black hole is expected to be almost zero, so only the mass and spin are needed.

"It is amazing to me that we have a complete description of this asteroid-sized object that is thousands of light years away," said Gou. "This means astronomers have a more complete understanding of this black hole than any other in our galaxy."

The team also announced that they have made the most accurate distance estimate yet of Cygnus X-1 using the National Radio Observatory's Very Long Baseline Array. The new distance is about 6,070 light years from Earth. This accurate distance was a crucial ingredient for making the precise mass and spin determinations.

The radio observations also measured the motion of Cygnus X-1 through space, and this was combined with its measured velocity to give the three-dimensional velocity and position of the black hole.

This work showed that Cygnus X-1 is moving very slowly with respect to the Milky Way, implying it did not receive a large "kick" at birth. This supports an earlier conjecture that Cygnus X-1 was not born in a supernova, but instead may have resulted from the dark collapse of a progenitor star without an explosion. The progenitor of Cygnus X-1 was likely an extremely massive star, which initially had a mass greater than about 100 times the sun before losing it in a vigorous stellar wind.

In 1974, soon after Cygnus X-1 became a good candidate for a black hole, Stephen Hawking placed a bet with fellow astrophysicist Kip Thorne, a professor of theoretical physics at the California Institute of Technology, that Cygnus X-1 did not contain a black hole. This was treated as an insurance policy by Hawking, who had done a lot of work on black holes and general relativity.

By 1990, however, much more work on Cygnus X-1 had strengthened the evidence for it being a black hole. With the help of

family, nurses and friends, Hawking broke into Thorne's office, found the framed bet, and conceded.

"For 40 years, Cygnus X-1 has been the iconic example of a black hole. However, despite Hawking's concession, I have never been completely convinced that it really does contain a black hole -- until now," said Thorne. "The data and modeling described in these three papers at last provide a completely definitive description of this binary system."

The Marshall Space Flight Center manages the Chandra program for NASA's Science Mission Directorate at Headquarters in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

More information is available at <http://www.nasa.gov/chandra>.

[› Back to Top](#)

Fifth Annual Science & Technology Jamboree to be held Nov. 30

The fifth annual Science & Technology Jamboree will be held at 9 a.m., Nov. 30, at the National Space Science and Technology Center on Sparkman Drive in Room 4078. Light refreshments will be available at 8:30 a.m.

The jamboree is an event where team members can show off their science work to the Marshall Space Flight Center community. Each speaker can present one slide and talk for two minutes.

For details on how to submit slides or for more information, contact Marcia Crowe at marcia.e.crowe@nasa.gov or Michelle Russell at michelle.p.russel@nasa.gov.

[› Back to Top](#)

Obituaries

Arthur T. Ousley, 93, of Memphis, Tenn., died Oct. 16. He retired from the Marshall Center in 1979 as a technical management systems engineer.

Charles R. Askew, 80, of Decatur died Nov. 5. He retired from the Marshall Center in 1992 as a technical management supervisor. He is survived by his wife, Joanna Askew.

William Emanuel, 79, of Huntsville died Nov. 9. He retired from the Marshall Center in 1990 as a mission operations integration engineer. He is survived by his wife, Joan Picha Emanuel.

Joe Patterson, 86, of Huntsville died Nov. 16. He retired from the Marshall Center in 1981 as an aerospace engineer technician. He is survived by his wife, Martha Ann Stout Patterson.

Find this article at:

<http://www.nasa.gov/centers/marshall/about/star/index.html>